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Current status and challenges in disease surveillance and epidemiological investigation systems for companion animals in South Korea

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Abstract

The surveillance and epidemiological investigation systems for companion animals in South Korea are significantly underdeveloped compared to those for humans and livestock. Recent outbreaks, such as idiopathic neuromuscular syndrome and highly pathogenic avian influenza among cats, have highlighted the need for reliable systems. This short review conducts situation analysis regarding disease surveillance and epidemiological investigation for companion animals in South Korea. The current challenges include an absence of administrative leadership, a lack of legal support, and unreliable medical data. The recommendations for future directions include clear leadership by the Animal and Plant Quarantine Agency, amending the Act on the Prevention of Contagious Animal Diseases to include companion animals, and enhancing the quality of medical data through standardized coding systems, such as Systematized Nomenclature of Medicine Clinical Terms. In addition, sentinel surveillance rather than universal systems should be established to provide adequate incentives for local practitioners to provide data and develop sustainable public–private networks. These recommendations could be important for developing a comprehensive and sustainable system for disease surveillance and epidemiological investigation in the companion animal field.

Keywords: disease surveillance; epidemiological investigation; pet; Republic of Korea; disease control

Introduction

In recent years, South Korea has experienced significant challenges in controlling the diseases of companion animals, implying social demands for reliable disease surveillance and epidemiological investigation systems. One notable event was the neuromuscular disease outbreak in companion cats. In April 2023, the Ministry of Agriculture, Food and Rural Affairs reported multiple cat deaths. The authorities investigated because specific commercial cat foods were suspected of being potential causes. Nevertheless, the investigation focused on detecting deleterious substances in foods [1] rather than implementing an epidemiological investigation to compare the risks between exposed and unexposed cats. The lack of epidemiological investigations would impede finding the specifying possible causes and associations. Therefore, the event highlighted significant gaps in the current epidemiological investigation system for companion animals in South Korea. On the other hand, another noticeable event was reported regarding the outbreak

of highly pathogenic avian influenza (HPAI) A (H5N1) in 2 cat shelters in Seoul in July 2023, causing the deaths of 38 out of 40 cats in the shelters [2]. Although proper epidemiological investigations identified that contaminated cat food with raw duck meat could have been a possible infection source, the event underscored the importance of a regular surveillance system on companion animals [2]. The 2 recent events related to companion cats have implied possible gaps in disease surveillance systems and epidemiological investigation for these animals, including delayed detection and inadequate responses.

Systems for domestic animals and humans have been improved [3–6] and have effectively supported general health systems for domestic animals and humans. Those systems could be benchmarked to develop or improve the systems in the companion animal medical field. In this regard, a comparative review was conducted to identify current gaps and suggest future directions.

Brief review of systems of disease surveillance and epidemiological investigation for industrial animals and humans

The systems for disease surveillance and epidemiological investigation for industrial animals and humans are relatively advanced and have successfully supported effective disease control by the authorities. The Animal and Plant Quarantine Agency (APQA) is responsible for managing surveillance and epidemiological investigation systems for infectious diseases in livestock [3,5,7,8]. The passive surveillance is usually based on disease reports from livestock owners and veterinarians. The information collected consists of livestock farm locations, animal species, and the number of cases and deaths. On the other hand, active surveillance includes a preplanned, systematic investigation by authorities. Local governmental workers can visit livestock farms to collect samples and test if there are infected animals. Target diseases include disastrous diseases, such as HPAI and foot-and-mouth disease, and endemic diseases, such as brucellosis and bovine tuberculosis. Regarding epidemiological investigations, farm-level data, such as the number of infected animals, date of disease onset, number of deaths, structure of the farms, and the visit history of related workers, are collected. The data from disease surveillance and epidemiological investigation have been stored in a data repository (Korea Animal Health Integrated System, https://www.kahis.go.kr/) [3]. The collected data can be analyzed to identify potential causes and assess risks of following infections.

The management of human infectious disease surveillance and epidemiological investigations in South Korea has been under the jurisdiction of the Korea Disease Control Agency (KDCA). Specific guidelines have been established for the monitoring and investigation procedures for each notifiable disease [4,6,9,10]. For example, diseases in class 1 must be reported to KDCA immediately because of their high lethality and the potential for severe societal consequences. Class 2 and 3 diseases must be notified within 24 hours. Individual-level data, such as age, sex, occupation, and date of symptom onset, have been reported via an online reporting system. An unusual increase in disease incidence or clustered distribution can be detected by analyzing the regular report. The collected data is also publicly accessible through the infectious disease web portal (https://dportal.kdca.go.kr/pot/index.do) after data aggregation. Additional details, such as the history of contact with the potential source of infection, can be acquired from the epidemiological investigation. The questionnaire forms for these investigations are structured for each target disease and are updated regularly. The surveillance of chronic diseases among humans is also possible through the national insurance system. The National Health Insurance Service can reimburse patients' medical expenses to individual hospitals and clinics and collect comprehensive health-related information, such as disease occurrence and medical examinations. The data can be used to monitor the descriptive epidemiology of various diseases [11,12].

In contrast, the surveillance and investigation systems for companion animals are significantly underdeveloped in South Korea (Table 1). Although the APQA has provided laboratory diagnostics services for companion animals, the collected data is not representative. Theoretically, the electronic medical records of companion animals from local veterinary clinics can be used for monitoring health-related events [13]. In South Korea, however, the data are usually fragmented and managed by individual clinics without a standardized encoding system. The lack of a systematic approach causes difficulties in suggesting representative statistics and detecting unusual health events in animal populations. The existing veterinary prescription management system, "eVet," [14] which was developed for controlling medication abuse, has potential use in surveillance and monitoring, but most small animal practitioners hesitate to use it because of the administrative burden.

Current challenges in establishing systems of disease surveillance and epidemiological investigation for companion animals

Developing a disease surveillance system for companion ani-

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Table 1. Comparison of disease surveillance and epidemiological investigation systems for companion animals with those for industrial animals and humans

Category	Humans	Industrial animals	Companion animals
Authorities	Korea Disease Control Agency	APQA	Not clear
Notifiable infectious diseases	Yes	Yes	No
Active surveillance	Yes	Yes	No
Passive surveillance	Yes	Yes	No
Laboratory surveillance	Yes	Yes	Yes (APQA)
Epidemiological surveillance	Yes	Yes	No

APQA, Animal and Plant Quarantine Agency.

mals poses several challenges for South Korea. First, no authority exists to lead, establish, or manage these systems. Currently, the APQA is the first candidate because it already has a surveillance system for domestic animals and includes the Department of Animal Welfare, which takes responsibility for the welfare issues of companion animals. In the United States and European Union, agencies equivalent to the APQA, such as the Animal and Plant Health Inspection Service, also handle the companion animal sector. Nevertheless, philosophical and technical differences can exist because the APQA focuses primarily on industrial animals rather than companion animals. The industrial animal sector generally aims to improve animal population productivity, whereas the companion animal sector focuses on individual-level health. In this regard, APQA requires a novel approach to take the leadership in the companion animal field.

Second, there is no legal basis to develop these systems. In humans and industrial animals, national notifiable infectious diseases are legally defined. The legal classification specifies target diseases for surveillance systems with specific regulations, such as reporting frequency, time intervals, and responsible authorities for each disease [15,16]. However, there are no equivalent notifiable diseases in companion animals. Consequently, related guidelines and regulations have not been developed. Similarly, there is no legal justification for conducting epidemiological investigations regarding companion animal disease. The limitation suggests a risk of litigation from the individuals or institutions suspected of being the source of the infection by the investigation. The epidemiological investigation during the recent avian influenza outbreak in companion cats was possible because highly pathogenic avian influenza is defined as a notifiable livestock infectious disease. On the other hand, most infectious diseases that occur frequently in companion animals have not been investigated. Even less legal support exists for epidemiological investigations of noncommunicable or idiopathic diseases despite the established systems for humans [17,18].

Third, the lack of a reliable medical data collection system is another critical challenge. Veterinary practitioners in tertiary institutions tend to strictly record the medical history of each animal patient to pursue effective communication among veterinarians or provide education to junior professionals. In contrast, veterinarians in local primary clinics often hesitate to record appropriately because of insufficient motivation. Consequently, relevant data, such as disease diagnoses and prescriptions at the primary clinics, are not usually usable. Data from primary veterinary clinics are much more important than those from secondary and tertiary institutions because acquiring representative big data for developing unbiased surveillance systems is important. In some countries, initiatives, such as the Small Animal Veterinary Surveillance Network (SAVSNET) and VetCompass, have been introduced and used as surveillance systems by analyzing aggregated data from multiple local clinics [19–21]. Systematic big data has provided valuable information, such as representative disease prevalence, incidence, and spatio-temporal trends. Nevertheless, introducing the systems to South Korea can be challenging because of the lack of standardized terminology and data recording practices across clinics [22].

Recommendations for future directions

This paper suggested 4 recommendations for developing systems in the companion animal field. First, the authorities responsible for the operation and governance of the system should be clearly designated. One of the best solutions would be establishing an independent system, considering that companion animal medicine is philosophically and technically different from human or industrial animal medicine. This would be challenging practically because the national or public interest in companion animal welfare and health is insufficient, and there is a lack of precedent examples globally. In this regard, it is practical for the APQA to manage the responsibility. Specifically, it is essential to develop a specific department within the APQA to manage these responsibilities effectively. Even in this case, however, the lack of workforce in the APQA can be problematic

because there has been a noticeable decrease in the number of veterinarians entering the agency. Public–private partnerships can address the workforce issue. For example, in human health care, epidemiological investigations of environmental health issues and diseases of unknown origin are often outsourced to private entities [17]. As mentioned earlier, SAVSNET and VetCompass [19–21], managed mainly by universities, can be used as surveillance systems.

Second, the current Act on the Prevention of Contagious Animal Diseases should be revised to establish a legal basis for disease surveillance and epidemiological investigations specifically for companion animals. Specifically, companion animals should be explicitly included in the Act as subjects for disease surveillance and epidemiological investigations. Several prevalent infectious diseases, such as distemper, influenza, coronavirus, rotavirus, and parvovirus infections, would be designated as notifiable diseases. There can be arguments that national benefits are much less for controlling companion animal diseases than human and livestock diseases, but companion animals can serve as sentinels for diseases affecting humans and livestock [23]. In addition, several zoonotic diseases can be transmitted from companion animals to humans, which can cause public concerns from a health perspective [24]. In addition, the amendment should allow for epidemiological investigations targeting diseases of unknown origin in companion animals. Currently, conducting epidemiological investigations for non-infectious diseases is challenging, even in livestock. Therefore, the revision could be beneficial in responding to unknown diseases of both companion and industrial animals.

Third, a systematic medical data collection framework should be developed. Specifically, a standardized medical coding system, such as the Systematized Nomenclature of Medicine Clinical Terms [25], should be produced to merge data from multiple institutions. Although it would be best if veterinarians become familiar with and agree to use the system, motivating them would be challenging because of their heavy labor burden. Therefore, a feasible solution would be developing a mapping system that automatically converts current non-standardized data to a standardized coding system. In addition, operating a universal surveillance system involving all veterinary clinics is unsustainable. Instead, a sentinel surveillance system could be practical, recruiting only a sufficient number of veterinary clinics and providing financial support to build and maintain the network.

Finally, there is a need to enhance the educational programs related to the epidemiology of companion animals for veterinarians and professionals in related fields. At present, such programs are inadequate in number, and the few programs available barely concentrate on companion animals. Specialized programs targeting companion animal epidemiology are essential because the underlying principles and methodologies of epidemiology differ between livestock and companion animals. These programs could improve attitudes and awareness regarding the importance of epidemiology among veterinarians, veterinary students, and related professionals and improve the quality of surveillance and epidemiological investigation systems in companion animals.

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References

1. Ministry of Agriculture, Food and Rural Affairs (MAFRA). Interim inspection results of three out of 30+ cat death-related feed inspection requests [Internet]. MAFRA; Sejong: 2024 [cited 2024 May 30]. Available from: https://www.mafra.go.kr/home/5109/subview.do?enc=Zm5jdDF8QEB8JTJGYmJzJTJGaG9tZSUyRjc5MiUyRjU3MDExMSUyRmFydGNsVmlldy5kbyUzRg%3D%3D.
2. Kim Y, Fournié G, Métras R, Song D, Donnelly CA, Pfeiffer DU, Nouvellet P. Lessons for cross-species viral transmission surveillance from highly pathogenic avian influenza Korean cat shelter outbreaks. Nat Commun 2023;14:6958.
3. Park SI, Park HS, Jeong WS, Lee GJ. Utilizing spatial and temporal information in KAHIS for aiding animal disease control activities. J Korean Assoc Geogr Inf Stud 2016;19:186–198.

https://doi.org/10.14405/kjvr.20240035

4. Sir WS, Cho SI, Lee K, Jang HG, Lee J, Baik YS, Han JW, Kim E. 2013 Modularization of Korea's Development Experience: Establishment of Korea's Infectious Disease Surveillance System. Korea Foundation for International Healthcare, Seoul, 2014.
5. Yoo DS, Kim Y, Lee ES, Lim JS, Hong SK, Lee IS, Jung CS, Yoon HC, Wee SH, Pfeiffer DU, Fournié G. Transmission dynamics of African swine fever virus, South Korea, 2019. Emerg Infect Dis 2021;27:1909–1918.
6. Yoo HS, Park O, Park HK, Lee EG, Jeong EK, Lee JK, Cho SI. Timeliness of national notifiable diseases surveillance system in Korea: a cross-sectional study. BMC Public Health 2009; 9:93.
7. Jeong M, Jang IH, Choe Y. Network analysis of swine farms and slaughters: based on automobile GPS data. J Korean Cartogr Assoc 2019;19:69–79.
8. Yoon H, Moon OK, Lee SH, Lee WC, Her M, Jeong W, Jung SC, Kim DS. Epidemiology of brucellosis among cattle in Korea from 2001 to 2011. J Vet Sci 2014;15:537–543.
9. Park O, Choi BY. Introduction and evaluation of communicable disease surveillance in the republic of Korea. J Prev Med Public Health 2007;40:259–264.
10. Yoo HS, Cho SI, Lee JK, Park HK, Lee EG, Kwon JW. A new surveillance indicator identifying optimal timeliness and accuracy: application to the Korean National Notifiable Disease Surveillance System for 2001-2007. Epidemiol Infect 2013; 141:2634–2643.
11. Kyoung DS, Kim HS. Understanding and utilizing claim data from the Korean National Health Insurance Service (NHIS) and Health Insurance Review & Assessment (HIRA) database for research. J Lipid Atheroscler 2022;11:103–110.
12. Seong SC, Kim YY, Park SK, Khang YH, Kim HC, Park JH, Kang HJ, Do CH, Song JS, Lee EJ, Ha S, Shin SA, Jeong SL. Cohort profile: the National Health Insurance Service-National Health Screening Cohort (NHIS-HEALS) in Korea. BMJ Open 2017;7:e016640.
13. Ward MP, Kelman M. Companion animal disease surveillance: a new solution to an old problem? Spat Spatiotemporal Epidemiol 2011;2:147–157.
14. Korean Veterinary Medical Association. Veterinary prescription management system [Internet]. Korean Veterinary Medical Association; Seongnam: 2024 [cited 2024 May 15]. Available from: https://www.evet.or.kr/.
15. Ministry of Agriculture, Food and Rural Affairs (MAFRA). Act on the Prevention of Contagious Animal Diseases. MAFRA, Sejong, 2024.
16. Ministry of Health and Welfare (MOHW). Infectious Disease Control and Prevention Act. MOHW, Sejong, 2024.
17. Kim EK, Moon S, Lee S. Procedure for responding to disease outbreaks of unexplained etiology. Public Health Wkly Rep 2019;12:755–758.
18. Lee KM, Park MY. Review of epidemiological research and perspectives for future environmental health progress in Korea. J Environ Health Sci 2022;48:138–150.
19. McGreevy P, Thomson P, Dhand NK, Raubenheimer D, Masters S, Mansfield CS, Baldwin T, Soares Magalhaes RJ, Rand J, Hill P, Peaston A, Gilkerson J, Combs M, Raidal S, Irwin P, Irons P, Squires R, Brodbelt D, Hammond J. VetCompass Australia: a national big data collection system for veterinary science. Animals (Basel) 2017;7:74.
20. O'Neill DG. VetCompass clinical data points the way forward. Vet Irel J 2012;2:353–356.
21. Radford AD, Noble PJ, Coyne KP, Gaskell RM, Jones PH, Bryan JG, Setzkorn C, Tierney Á, Dawson S. Antibacterial prescribing patterns in small animal veterinary practice identified via SAVSNET: the small animal veterinary surveillance network. Vet Rec 2011;169:310.
22. Min KD. Scoping review of machine learning and deep learning algorithm applications in veterinary clinics: situation analysis and suggestions for further studies. J Vet Clin 2023; 40:243–259.
23. Schmidt PL. Companion animals as sentinels for public health. Vet Clin North Am Small Anim Pract 2009;39:241–250.
24. Overgaauw PA, Vinke CM, Hagen MA, Lipman LJ. A one health perspective on the human-companion animal relationship with emphasis on zoonotic aspects. Int J Environ Res Public Health 2020;17:3789.
25. Chang E, Mostafa J. The use of SNOMED CT, 2013-2020: a literature review. J Am Med Inform Assoc 2021;28:2017–2026.